

## ARAC ESHWG REPORT AMJ 25.1309(b)

### **1 - What is underlying safety issue addressed by the FAR/JAR?**

JAR specific AMJ 25.1309(b) was introduced to cover two basic issues:

- (a) Faulty galley heating equipment has been the cause of many incidents which have resulted in smoke or fire in the cabin and of incidents involving injuries to cabin crew, etc. Improvements in the safety of aircraft domestic equipment design and installations should reduce the probability of such incidents and improve safety standards.
- (b) Recorded incidents have shown that the circuit protection devices used in motor power supplies, particularly those used in domestic systems, have not always provided adequate protection against failures which cause a motor overheat condition.

The advisory material provided in AMJ 25.1309(b) gives guidance on some acceptable methods of reducing the probability of failures which could cause airworthiness hazards.

### **2 - What are the current FAR and JAR standards?**

Current FAR and JAR texts for 25.1309 are identical, but JAR 25.1309(b) makes reference to AMJ 25.1309(b).

### **3 - What are the differences in the standards and what do these differences result in?**

FAR does not provide standards for domestic services and appliances.

### **4 - What, if any, are the differences in the means of compliance?**

JAA has a specific AMJ. There is no equivalent published FAA Advisory Material on the subject, apart from AC 25-10, which is less specific.

AMJ 25.1309(b)  
Equipment Systems and Installations  
See JAR 25.1309(b)

#### **1. Heated Domestic Appliances (Galley Equipment)**

1.1 The design and installation of heated domestic appliances should be such that no single failure (e.g. welded thermostat or contactor) can result in dangerous uncontrolled heating and consequent risk of fire or smoke or injury to occupants.

An acceptable method of achieving this is by the provision of a means independent of the normal temperature control system, which will automatically interrupt the electrical power supply to the unit in the event of an overheat condition occurring. The means adopted should be such that it cannot be reset in flight.

1.2 The design and installation of microwave ovens should be such that no hazard could be caused to the occupants or the equipment of the aeroplane under either normal operation or single failure conditions.

1.3 Heated liquid containers, e.g. water boilers, coffee makers should, in addition to overheat protection, be provided with an effective means to relieve over pressure, either in the equipment itself or in its installations.

NOTE: Due account should be taken of the possible effects of lime scale deposit both in the design and maintenance procedures of water heating equipment.

#### **2. Electric Overheat Protection Equipment, Including those Installed in Domestic Systems**

2.1 Unless it can be shown that compliance with JAR 25.1309(b) is provided by the circuit protective

device required by JAR 25.1357(a), electric motors and transformers etc. (including those installed in domestic systems, such as galleys and toilet flush systems) should be provided with a suitable thermal protection device if necessary to prevent them overheating such as to create a smoke or fire hazard under normal operation and failure conditions.

The following should be taken into consideration:

- a. Failures of any automatic control systems, e.g. automatic timer systems, which may cause the motor to run continuously;
- b. Short circuit failures of motor windings or transformer windings to each other or to the motor or transformer frame;
- c. Open circuit of one or more phases on multi-phase motors;
- d. Motor seizures;
- e. The proximity of flammable materials or fluids;
- f. The proximity of other aeroplane installations;
- g. Spillage of fluids, such as toilet waste;
- h. Accumulation of combustible material; and
- i. Cooling air discharge under normal operating or failure conditions.

## 5 - What is the proposed action?

According to the better plan for harmonisation, FAR/JAR 25.1309(b) is to be enveloped to the most stringent requirement. As there is no direct equivalent FAA AC text, the initial plan was to adopt AMJ 25.1309(b) as FAA advisory material.

The ESHWG position is that the AMJ 25.1309(b) is not the best place to add substantial material that is specific for domestic services and appliances only, since this could give the suggestion that 25.1309(b) is not applicable to other systems.

Furthermore it is proposed to have a lead in paragraph specific to domestic appliances which would contain the parts of the AMJ that are more appropriate to a rule text (see also 12), and also contain some parts of JAR 25X1499 that are relevant to the subject.

To accomplish this, the proposal is to:

- Introduce a new FAR/JAR 25.1365 within the "Miscellaneous Equipment" section of subpart F, that is specific to domestic appliances.
- Introduce a new AC/ACJ 25.1365 that is based on existing AMJ 25.1309(b) and ACJs to 25X1499, but with those elements that have been transferred to the rule removed.
- Delete existing AMJ 25.1309(b).
- See also 18 below

## 6 - What should the harmonized standard be?

**FAR/JAR 25.1365      Electrical appliances and motors**  
**(see ACJ 25.1365 - JAR only)**

**Note : FAR will not make reference to AC or ACJ in rule text**

- (a) Domestic appliances must be so designed and installed that in the event of failures of the electrical supply or control system, the requirements of FAR/JAR 25.1309 (b), (c) and (d) will be satisfied.

- (b) The installation of galleys and cooking appliances must be such as to minimise the risk of fire.
- (c) Domestic appliances, particularly those in galley areas, be so installed or protected as to prevent damage or contamination of other equipment or systems from fluids or vapours which may be present during normal operation or as a result of spillage, where such damage or contamination may hazard the aeroplane.
- (d) Unless it can be shown that compliance with FAR/JAR 25.1309(b) is provided by the circuit protective device required by FAR/JAR 25.1357(a), electric motors and transformers etc. (including those installed in domestic systems, such as galleys and toilet flush systems) must be provided with a suitable thermal protection device if necessary to prevent them overheating such as to create a smoke or fire hazard under normal operation and failure conditions.

**7 - How does this proposed standard address the underlying safety issue (identified under #1)?**

The now proposed standard contains material that was introduced in JAR 25 by NPA 25DF-191. At first as NPA and since the introduction in JAR-25 as basic JAR code the material was used in aircraft certification programs since 1987 and has improved the safety of domestic appliances significantly. (for instance by the introduction of an overheat protection independent from the normal temperature regulation of heating galley equipment). The proposal can be considered as an improvement of current practices and adoption of existing JAA text to cover the underlying safety issue.

**8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

The proposed standard increases the level of safety.

**9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

The proposed standard increases the level of safety.

**10 - What other options have been considered and why were they not selected?**

No other options have been considered.

**11 - Who would be affected by the proposed change?**

Aircraft Operators and Manufacturers together with galley equipment and electrical equipment suppliers could be affected by this change.

Since new certificated aircraft have to be supplied with new standard galley equipment, airplane operators may elect to introduce the same new equipment on their old fleet for reason of fleet commonality.

**12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?**

Parts of AMJ 25.1309(b) that are more pertinent to a rule text have been moved to a new FAR/JAR 25.1365 paragraph specific to domestic appliances.

**13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted?**

There is no equivalent published FAA Advisory Material on the subject, apart from AC 25-10, which is less specific. It is recommended that a revised AMJ 25.1309(b) be adopted for FAR/JAR 25 for compliance with the new FAR/JAR 25.1365.

**AC/ACJ 25.1365**  
**Domestic appliances**  
**See FAR/JAR 25.1365**

**1. Heated Domestic Appliances (Galley Equipment)**

1.1 The design and installation of heated domestic appliances should be such that no single failure (e.g. welded thermostat or contactor, loss of water supply) can result in dangerous overheating and consequent risk of fire or smoke or injury to occupants.

An acceptable method of achieving this is by the provision of a means independent of the normal temperature control system, which will automatically interrupt the electrical power supply to the unit in the event of an overheat condition occurring. The means adopted should be such that it cannot be reset in flight.

1.2 The design and installation of microwave ovens should be such that no hazard could be caused to the occupants or the equipment of the aeroplane under either normal operation or single failure conditions.

1.3 Heated liquid containers, e.g. water boilers, coffee makers should, in addition to overheat protection, be provided with an effective means to relieve overpressure, either in the equipment itself or in its installations.

**NOTES:**

Due account should be taken of the possible effects of lime scale deposit both in the design and maintenance procedures of water heating equipment.

The design of galley and cooking appliance installations should be such as to facilitate cleaning to limit the accumulation of extraneous substances which may constitute a fire risk.

**2. Electric Overheat Protection Equipment**

In showing compliance with FAR/JAR 25.1365(d), the following should be taken into consideration:

- a. Failures of any automatic control systems, e.g. automatic timer systems, which may cause the motor to run continuously;
- b. Short circuit failures of motor windings or transformer windings to each other or to the motor or transformer frame;
- c. Open circuit of one or more phases on multi-phase motors;
- d. Motor seizures;
- e. The proximity of flammable materials or fluids;
- f. The proximity of other aeroplane installations;
- g. Spillage of fluids, such as toilet waste;
- h. Accumulation of combustible material; and
- i. Cooling air discharge under normal operating or failure conditions.

**3. Water systems**

3.1 Where water is provided in the aeroplane for consumption or use by the occupant, the associated system should be designed so as to ensure that no hazard to the aeroplane can result from water coming

into contact with electrical or other systems.

3.2 Service connections (filling points) should be of a different type from those used for other services, such that water could not inadvertently be introduced into the systems for other services.

**14 - How does the proposed standard compare to the current ICAO standard?**

There is no equivalent ICAO standard.

**15 - Does the proposed standard affect other HWG's?**

This proposal does not affect other HWG's.

**16 - What is the cost impact of complying with the proposed standard?**

Since the new and higher safety standard was introduced ten years ago (by NPA 25DF-191) and was applied in all JAA certification programs since that time, the cost of implementation in the harmonised FAR/JAR-25 code seems to be negligible.

**17 - Does the HWG want to review the draft NPRM at "Phase 4" prior to publication in the Federal Register?**

Yes.

**18 - In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain.**

The ESHWG considers that the Category 1 fast track harmonization process is not appropriate for this rule for the following reasons:

The proposal being made is to introduce a new rule derived from existing rule text and advisory material. The main reason is that reference to AMJ 25.1309 is only advisory and relates only to a general rule or requirement whilst the subject is specific to domestic appliances and electrical motors. Therefore, additional time is needed to consolidate this material into a new rule 25.1365, Electrical appliances and motors, with associated advisory material.

It is proposed that this task is now made a Category 3 item.

## ARAC ESHWG REPORT 25.1310

### NOTE

There is not yet a FAR/JAR 25.1310. JAA has issued NPA 25F-281 for this paragraph but FAA has not yet issued related NPRM. The NPRM is now in for the FAA's Legal review and comments. The hope is to publish it prior to the publication of the fast-track harmonization proposals. It is assumed that NPRM on 25.1309/25.1310 will be published before the package covered in this report.

### **1 - What is underlying safety issue addressed by the FAR/JAR?**

Proposed FAR/JAR 25.1310 presently covered by FAR/JAR 25.1309(e) and (f) define what is an 'essential load' on the power supply and the conditions under which those loads must be supplied.

### **2 - What are the current FAR and JAR standards?**

#### **Current FAR text:**

***Based on SD&A HWG proposal  
(NPA 25F-281 on JAA side, NPRM not yet published on the FAA side)***

#### **Section 25.1310 Power source capacity and distribution.**

- (a) Each installation whose functioning is required for type certification or by operating rules and that requires a power supply is an "essential load" on the power supply. The power sources and the system must be able to supply the following power loads in probable operating combinations and for probable durations.
  - (1) Loads connected to the system with the system functioning normally.
  - (2) Essential loads, after failure of any one prime mover, power converter, or energy storage device.
  - (3) Essential loads after failure of –
    - (i) Any one engine on two-engined airplanes; and
    - (ii) Any two engines on three-or-more engined airplanes.
  - (4) Essential loads for which an alternate source of power is required, after any failure or malfunction in any one power supply system, distribution system, or other utilization system.
- (b) In determining compliance with paragraphs (a)(2) and (3) of this section, the power loads may be assumed to be reduced under a monitoring procedure consistent with safety in the kinds of operation authorized. Loads not required in controlled flight need not be considered for the two-engine-inoperative condition on airplanes with three or more engines.

#### **Current JAR text:**

***Based on SD&A HWG proposal  
(NPA 25F-281 on JAA side)***

#### **JAR 25.1310 Power source capacity and distribution**

- (a) Each installation whose functioning is required for type certification or by operating rules and that requires a power supply is an "essential load" on the power supply. The power sources and the system must be able to supply the following power loads in probable operating combinations

and for probable durations (see ACJ 25.1310(a)):

- (1) Loads connected to the system with the system functioning normally.
- (2) Essential loads, after failure of any one prime mover, power converter, or energy storage device.
- (3) Essential loads after failure of -
  - (i) Any one engine on two-engined aeroplanes; and
  - (ii) Any two engines on three-or-more engined aeroplanes.

After the failure of any two engines on a three-engined aeroplane, those services essential to airworthiness must continue to function and perform adequately within the limits of operation implied by the emergency conditions. (See ACJ 25.1310(a)(3).)

- (4) Essential loads for which an alternate source of power is required, after any failure or malfunction in any one power supply system, distribution system, or other utilisation system.
- (b) In determining compliance with sub-paragraphs (a)(2) and (3) of this paragraph, the power loads may be assumed to be reduced under a monitoring procedure consistent with safety in the kinds of operation authorised. Loads not required in controlled flight need not be considered for the two-engine-inoperative condition on aeroplanes with three or more engines.

### 3 - What are the differences in the standards and what do these differences result in?

These requirements, formerly contained in FAR/JAR 25.1309(e) and (f), are not directly related to the other safety and analysis requirements of JAR 25.1309 and are stated separately for the purpose of clarity through NPA 25F-281. JAR 25.1310 and FAR 25.1310 are not be completely harmonised in that JAR 25.1310 contains requirements for maintenance of airworthiness essential services after failure of any two engines on a three-engined aeroplane and makes reference to two ACJs.

### 4 - What, if any, are the differences in the means of compliance?

JAR has two specific ACJs.

#### **ACJ 25.1310(a)**

**(Same as ACJ No. 6 to JAR 25.1309)**

Power Source Capacity and Distribution (Acceptable Means of Compliance)

See JAR 25.1310(a)

When alternative or multiplication of systems and equipment is provided to meet the requirements of JAR 25.1310(a), the segregation between circuits should be such as to minimise the risk of a single occurrence causing multiple failures of circuits or power supplies of the system concerned. For example, electrical cable bundles or groups of hydraulic pipes should be so segregated as to prevent damage to the main and alternative systems and power supplies.

#### **ACJ 25.1310(a)(3)**

**(Same as ACJ No. 7 to JAR 25.1309)**

Equipment, Systems and Installations (Interpretative Material)

See JAR 25.1310(a)(3)

For aeroplanes for which the two-power-units-inoperative performance is scheduled, such services should remain operative as will enable the flight to be safely continued and terminated. In achieving this -

- a. Some reduction in the performance of particular services is permissible (e.g. airframe ice-protection),
- b. It may be assumed that electrical loads are reduced in accordance with a predetermined procedure which is consistent with safety in the types of operation for which the aeroplane is certificated, and

- c. Consideration should be given to any restrictions that may be necessary should the air supply for cabin pressure be interrupted or seriously reduced consequent upon the failure of the power-units.

**5 – What is the proposed action?**

According to the better plan for harmonisation, FAR/JAR 25.1310 is to be enveloped to the most stringent requirement, which is FAR 25.1310. JAR text can be considered as an alleviation of the services to be maintained after the failure of any two-engines on a three-engined airplane. This should be also applicable on a four (or more) engined aircraft.

**6 - What should the harmonized standard be?**

The standard of FAR 25.1310 as proposed through the SD&A HWG

**7 - How does this proposed standard address the underlying safety issue (identified under #1)?**

The proposal can be considered as a clarification of existing requirements and in line with current practices.

**8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

The proposed standard maintains the same level of safety.

**9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

This proposal is in line with current industry practices.

**10 - What other options have been considered and why were they not selected?**

The adoption of JAR was considered however for the reasons as stated above FAR was retained.

**11 - Who would be affected by the proposed change?**

As the proposal is in line with current design practices, the effect is considered to be minimum for Aircraft Operators and Manufacturers affected by this change.

**12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?**

None.

**13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted?**

There is no current published FAA Advisory Material . It is recommended that the JAR ACJ to 25.1310(a) be adopted as FAA advisory material as it provides useful acceptable means of compliance.



**14 - How does the proposed standard compare to the current ICAO standard?**

The proposal is in line with ICAO Annex 8 Chapter 8 Electrical systems

**15 - Does the proposed standard affect other HWG's?**

This proposal does affect the SD&A HWG because it covers part of their proposal for review of 25.1309/1310.

**16 - What is the cost impact of complying with the proposed standard?**

As the proposal is in line with current design practices the cost impact will be negligible.

**17 - Does the HWG want to review the draft NPRM at "Phase 4" prior to publication in the Federal Register?**

See 18.

**18 - In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain.**

The ESHWG considers that the Category 1 fast track harmonization process is not appropriate for this rule for the following reasons:

1. Additional time is required to review in more detail the concept of "essential load" due to the fact that the term "essential load" as defined in the current text conflicts with the definition of "essential" used in other sections of the FAR/JAR. This conflict in definitions can lead to various interpretations in the compliance to the rule. The wording of the FAR/JAR should be revised to ensure the correct interpretation of the word "essential".

2. The initial tasking was based on the hypothesis that the proposed 25.1310 coming from the SD&A HWG would be circulated as NPA/NPRM and published as final text. NPA 25F-281 has been published and commented upon, but the equivalent NPRM is still within the FAA. It is impossible to harmonise 25.1310 before it is published.

It is proposed that this task be made a Category 3 item.

## **ARAC ESHWG REPORT 25.1351(b)**

### **1 - What is underlying safety issue addressed by the FAR/JAR?**

The FAR/JAR give requirements relating to electrical generating system power sources, distribution busses and cables, and associated control, regulation and protection devices.

### **2 - What are the current FAR and JAR standards?**

#### **Current FAR text:**

##### **Section 25.1351 General**

- (b) Generating system. The generating system includes electrical power sources, main power busses, transmission cables, and associated control, regulation, and protective devices. It must be designed so that -
  - (5) There are means accessible, in flight, to appropriate crew members for the individual and collective disconnection of the electrical power sources from the system.

#### **Current JAR text:**

##### **JAR 25.1351 General**

- (b) Generating system. The generating system includes electrical power sources, main power busses, transmission cables, and associated control, regulation, and protective devices. It must be designed so that -
  - (5) There are means accessible where necessary, in flight, to appropriate crew members for the individual and rapid disconnection of each electrical power source (see ACJ 25.1351(b)(5));

### **3 - What are the differences in the standards and what do these differences result in?**

JAR 25.1351(b)(5), with its related ACJ 25.1351(b)(5), provide different accessibility requirements for means to disconnect power sources from the electrical system. FAR 25.1351(b)(5) requires means that are accessible in flight for individual and collective disconnection of all power sources. JAR 25.1351(b)(5) specifies "individual and rapid disconnection" instead of "individual and collective disconnection" and allows for flexibility by use of the words "where necessary".

### **4 - What, if any, are the differences in the means of compliance?**

The JAR has a specific ACJ to cover the means for disconnecting power sources from the electrical system.

### **5 - What is the proposed action?**

The proposed action is to adopt JAR 25.1351(b)(5) and associated ACJ. This allows for a greater flexibility for appropriate action to be taken, and removes the implication that a single means for disconnection of all electrical power sources is required. This is also in line with current design practices.

## ARAC ESHWG REPORT 25.1351(c)

### **1 - What is underlying safety issue addressed by the FAR/JAR?**

FAR and JAR 25.1351(c) define minimum requirements for connecting external power to the airplane electrical power system, with the objective to protect the airplane/systems from possible malfunctions from the external power.

### **2 - What are the current FAR and JAR standards?**

#### **Current FAR text:**

##### **Sec. 25.1351 General.**

- (c) External power. If provisions are made for connecting external power to the airplane, and that external power can be electrically connected to equipment other than that used for engine starting, means must be provided to ensure that no external power supply having a reverse polarity, or a reverse phase sequence, can supply power to the airplane's electrical system.

#### **Current JAR text:**

##### **JAR 25.1351 General**

- (c) External power. If provisions are made for connecting external power to the aeroplane, and that external power can be electrically connected to equipment other than that used for engine starting, means must be provided to ensure that no external power supply having a reverse polarity, a reverse phase sequence (including crossed phase and neutral), open circuit line, incorrect frequency or over-voltage, can supply power to the aeroplane's electrical system.

### **3 - What are the differences in the standards and what do these differences result in?**

JAR 25.1351(c) refines the FAR requirements by requiring additional parameters to be monitored for the external power. This was introduced with NPA 25DF-191 due to an increasing number of incidents being reported of damage being caused to aircraft installed equipment, by malfunctioning external power supply equipment. Modern aircraft do already incorporate comprehensive external power protection systems.

### **4 - What, if any, are the differences in the means of compliance?**

None.

### **5 - What is the proposed action?**

The ESHWG is proposing to envelope JAR 25.1351(c) with a minor revision to replace "incorrect frequency or over-voltage" by "incorrect frequency or voltage". This ensures that all incorrect voltage conditions are addressed.

## **6 - What should the harmonized standard be?**

Section 25.1351 General

( c) External power. If provisions are made for connecting external power to the aeroplane, and that external power can be electrically connected to equipment other than that used for engine starting, means must be provided to ensure that no external power supply having a reverse polarity, a reverse phase sequence (including crossed phase and neutral), open circuit line, incorrect frequency or voltage, can supply power to the aeroplane's electrical system.

## **7 - How does this proposed standard address the underlying safety issue (identified under #1)?**

The proposed standard provides for improved protection for aeroplane systems by adopting the JAR and specifying that means must be provided to protect the aircraft from any incorrect voltage.

## **8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

The proposed standard increases the level of safety because it requires additional protection for aircraft systems in regard to incorrect external power supply parameters.

## **9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

This proposal is in line with current industry practices with the exception of low voltage protection (the deletion of the word "over" before voltage in the text implies the requirement for protection against both over and under voltage conditions - see 5 above).

## **10 - What other options have been considered and why were they not selected?**

The adoption of FAR and JAR were both considered however for the reasons as stated the modified JAR text (as proposed) was selected.

## **11 - Who would be affected by the proposed change?**

As the proposal is generally in line with current design practices, the effect is considered to be minimum for Aircraft Operators and Manufacturers affected by this change.

## **12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?**

There is no current advisory material that needs to be included in the rule text or the preamble.

## **ARAC ESHWG REPORT 25.1353(c)(5)**

### **1 - What is underlying safety issue addressed by the FAR/JAR?**

The FAR/JAR gives requirements relating to the design and installation of nickel cadmium storage batteries.

### **2 - What are the current FAR and JAR standards?**

#### **Current FAR text:**

##### **Section 25.1353 Electrical Equipment and Installations**

(c) Storage batteries must be designed and installed as follows -

- (5) Each nickel cadmium battery installation capable of being used to start an engine or auxiliary power unit must have provisions to prevent any hazardous effect on structure or essential systems that may be caused by the maximum amount of heat the battery can generate during a short circuit of the battery or of individual cells.

#### **Current JAR text:**

##### **JAR 25.1353 Electrical equipment and installations**

(c) Storage batteries must be designed and installed as follows -

- (5) Each nickel cadmium battery installation must have provisions to prevent any hazardous effect on structure or essential systems that may be caused by the maximum amount of heat the battery can generate during a short circuit of the battery or of individual cells.

### **3 - What are the differences in the standards and what do these differences result in?**

JAR 25.1353(c)(5) requires provisions to prevent any hazardous effect on structure or essential systems by all nickel cadmium batteries regardless of their capabilities; whereas FAR 25.1353(c)(5) requires provisions only for the batteries capable of being used to start an engine or auxiliary power unit.

### **4 - What, if any, are the differences in the means of compliance?**

All nickel cadmium batteries are required to show compliance to the JAR 25.1353(c)(5) requirements. Whereas FAR 25.1353(c)(5) requires only batteries with engine and APU start capability to show compliance.

### **5 - What is the proposed action?**

The proposed action is to adopt JAR 25.1353(c)(5). This allows for coverage of the greater range of battery sizes and capabilities.

### **6 - What should the harmonized standard be?**

(c) Storage batteries must be design and installed as follows –

- (5) Each nickel cadmium battery installation must have provisions to prevent any hazardous effect on structure or essential systems that may be cause by the maximum amount of heat the battery can generate during a short circuit of the battery or of individual cells.

**7 - How does this proposed standard address the underlying safety issue (identified under #1)?**

Safety is ensured for the design and installation of nickel cadmium batteries regardless of their sizes and capabilities.

**8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

By covering all nickel cadmium battery sizes, the safety will be increased.

**9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

This proposal is in line with current industry practice for aircraft main batteries used for engine or APU starting, however in relation to all other nickel cadmium batteries, the level of safety may be increased.

**10 - What other options have been considered and why were they not selected?**

The adoption of FAR was considered however for the reasons as stated above JAR was selected. The ESHWG considered deletion of the reference to "Nickel Cadmium" batteries so that the rule would apply to all battery types. This change was not adopted because it does not fit within the fast track harmonization guidelines and would require additional evaluation of the impact on other battery types.

**11 - Who would be affected by the proposed change?**

As stated above for main batteries the proposal is in line with current design practices and therefore the effect is considered to be minimal. There may be an impact on other nickel cadmium battery installations by aircraft operators, manufacturers and modifiers.

**12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?**

None.

**13 - Is existing FAA advisory material adequate?**

There are no additional FAA or JAA advisory materials required.

**14 - How does the proposed standard compare to the current ICAO standard?**

This proposal is in line with ICAO Annex 8 Chapter 8 Electrical Systems.

**15 - Does the proposed standard affect other HWG's?**

This proposal does not affect other HWG's.

**16 - What is the cost impact of complying with the proposed standard?**

As the proposal is in line with current design practices for aircraft main batteries the cost impact will be negligible. There may be an impact on other nickel cadmium battery installations by aircraft operators, manufacturers and modifiers.

**17 - Does the HWG want to review the draft NPRM at "Phase 4" prior to publication in the Federal Register?**

Yes.

**18 - In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain.**

The ESHWG considers that the fast track harmonization process is appropriate for this rule.

**ARAC ESHWG REPORT 25.1353(c)(6)****1 - What is underlying safety issue addressed by the FAR/JAR?**

FAR/JAR give requirements relating to nickel cadmium battery installations with regard to protection against battery overheating.

**2 - What are the current FAR and JAR standards?****Current FAR text:****Section 25.1353(c)(6)**

(6) Nickel cadmium battery installations capable of being used to start an engine or auxiliary power unit must have -

- (i) A system to control the charging rate of the battery automatically so as to prevent battery overheating;
- (ii) A battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or
- (iii) A battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure.

**Current JAR text:****JAR 25.1353(c)(6)**

(6) Nickel cadmium battery installations that are not provided with low-energy charging means must have-

- (i) A system to control the charging rate of the battery automatically so as to prevent battery overheating;
- (ii) A battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or
- (iii) A battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure. [ (See ACJ 25.1353 (c)(6)(ii) and (iii).) ]

Note: The existing text of JAR 25.1353(c)(6) is such that some confusion exists in the interpretation of the relationship of paragraphs (i) and (ii). JAA Temporary Guidance Material TGM/25/03 was issued to correct the interpretation between these paragraphs. The correct interpretation between JAR 25.1353(c)(6)(i) and JAR 25.1353(c)(6)(ii) is that an 'OR' is to be placed between the two paragraphs.



**ARAC ESHWG REPORT 25.1353(d)****1 - What is underlying safety issue addressed by the FAR/JAR?**

The rule gives design requirements relating to the installation of aircraft electrical wiring. All wire and equipment installations must provide for continuous fault protection against fire and smoke hazards, there must be permanent cable, connector and terminal identification and the risk of mechanical, fluid, heat or vapor damage must be minimized.

**2 - What are the current FAR and JAR standards?****Current FAR text:**

There is no current FAR rules text.

**Current JAR text:****JAR 25.1353(d)**

(d) Electrical cables and cable installations must be designed and installed as follows:

- (1) The electrical cables used must be compatible with the circuit protection devices required by JAR 25.1357, such that a fire or smoke hazard cannot be created under temporary or continuous fault conditions.
- (2) Means of permanent identification must be provided for electrical cables, connectors and terminals.
- (3) Electrical cables must be installed such that the risk of mechanical damage and/or damage caused by fluids, vapors or sources of heat, is minimized.

**3 - What are the differences in the standards and what do these differences result in?**

JAR 25.1353(d) provides very explicit aircraft installation design requirements for electrical cables. FAR 25.1353(a), (b) and (c) does not address these design features.

**4 - What, if any, are the differences in the means of compliance?**

The JAR states specific requirements for cable installations that must be met. Installation designs approved by the FAR's typically meet the JAR requirement. Installation designers through experience have adopted the practice of permanent identification, protection and installation routing to minimize the risk of damage to electrical cables.

**5 - What is the proposed action?**

Adoption of JAR 25.1353(d) in its entirety is recommended. This requires an appropriate design action to be taken, removes the possibility that a designer may not consider a critical installation design condition and is in line with current best design practices.

## **ARAC ESHWG REPORT 25.1355 (c)**

### **1 - What is underlying safety issue addressed by the FAR/JAR?**

The FAR/JAR gives requirements relating to the arrangement, protection and control of the electrical feeders from the busbars to the distribution points. The divisions of loads among the feeders shall be such that no single fault occurring in any feeder or associated control circuit will hazard the aeroplane.

### **2 - What are the current FAR and JAR standards?**

#### **Current FAR text:**

##### **Section 25.1355(c)**

- (c) If two independent sources of electrical power for particular equipment or systems are required by this chapter, in the event of the failure of one power source for such equipment or system, another power source (including its separate feeder) must be automatically provided or be manually selectable to maintain equipment or system operation.

#### **Current JAR text:**

##### **JAR 25.1355(c)**

- (c) If two independent sources of electrical power for particular equipment or systems are required by this JAR-25, in the event of the failure of one power source for such equipment or system, another power source (including its separate feeder) must be automatically provided or be manually selectable to maintain equipment or system operation. (See ACJ 25.1355 (c) and ACJ No. 6 to JAR 25.1309.)

### **3 - What are the differences in the standards and what do these differences result in?**

The FAR refers to "chapter" while the JAR refers to "JAR 25" in the rule text. The FAR reference to "chapter" implies broader coverage. The JAR also refers to advisory material.

### **4 - What, if any, are the differences in the means of compliance?**

There are no differences in the means of compliance, however the JAR has specific ACJ's as follows: The ACJ to JAR 25.1355(c) introduced Interpretative Material concerning the segregation of electrical feeders to minimize the possibility of cascade or multiple failures. In addition, ACJ No. 6 to JAR 25.1309 refers to the same objective but in relation to the installation of the equipment and systems rather than the electrical feeders only. Segregation of electrical cable bundles or groups of hydraulic pipes being examples that are explicitly quoted.

### **5 - What is the proposed action?**

In line with the fast track harmonization process, the FAR with text changes identified in Item 6 is to be adopted.

**6 - What should the harmonized standard be?**

FAR/JAR 25.1355(c)

If two independent sources of electrical power for particular equipment or systems are required for certification or by operating rules, in the event of the failure of one power source for such equipment or system, another power source (including its separate feeder) must be automatically provided or be manually selectable to maintain equipment or system operation.

(See ACJ 25.1355 (c) and ACJ No. 6 to JAR 25.1309.) This reference applies to JAR only.

Note: ACJ No 6 to 25.1309 is likely to become ACJ 25.1310(a) if the proposed adoption of FAR/JAR 25.1310 takes place.

**7 - How does this proposed standard address the underlying safety issue (identified under #1)?**

Regulation remains unchanged.

**8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

The level of safety is maintained whilst providing clarification in the form of acceptable means of compliance.

**9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

The level of safety is maintained whilst providing clarification in the form of acceptable means of compliance.

**10 - What other options have been considered and why were they not selected?**

Adoption of JAR was considered, however for reasons as stated above, the FAR text was selected together with JAR Interpretative material.

**11 - Who would be affected by the proposed change?**

As proposal is in line with current design practices, there should be minimal effect on operators or manufacturers.

**12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?**

None.

**13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted?**

As no equivalent Advisory Material exists, it is recommended that the current ACJ to JAR 25.1355(c) and ACJ No 6 to JAR 25.1309 be retained and adopted as FAA advisory material.

**14 - How does the proposed standard compare to the current ICAO standard?**

This proposal is in line with ICAO Annex 8 Chapter 8 Electrical Systems..

**15 - Does the proposed standard affect other HWG's?**

No.

**16 - What is the cost impact of complying with the proposed standard?**

As the proposal is in line with existing regulations and current design practice, the cost impact will be negligible.

**17 - Does the HWG want to review the draft NPRM at "Phase 4" prior to publication in the Federal Register?**

Yes.

**18 – In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain.**

The ESHWG considers that the fast track harmonisation process is appropriate for this rule.

## **ARAC ESHWG REPORT 25.1431(d)**

### **1 - What is underlying safety issue addressed by the FAR/JAR?**

JAR specifies requirements relating to the design and installation of electronic equipment such that these may not cause essential loads to malfunction. There is no equivalent FAR.

### **2 - What are the current FAR and JAR standards?**

#### **Current FAR text:**

There is no current FAR rules text.

#### **Current JAR text:**

#### **JAR 25.1431 Electronic Equipment**

- (d) Electronic equipment must be designed and installed such that it does not cause essential loads to become inoperative, as a result of electrical power supply transients or transients from other causes.

### **3 - What are the differences in the standards and what do these differences result in?**

There is no equivalent FAR. JAR requires additional verification that any electronic equipment will not cause essential loads to become inoperative as a result of electrical power supply transients or transients from other causes.

### **4 - What, if any, are the differences in the means of compliance?**

Since there are no equivalent FAR standards, additional verification is required by JAR that electronic equipment will not cause essential loads to become inoperative as a result of electrical power supply transients or transients from other causes.

### **5 - What is the proposed action?**

The proposed action is to adopt JAR 25.1431(d).

### **6 - What should the harmonized standard be?**

#### **FAR/JAR 25.1431 Electronic Equipment**

- (d) Electronic equipment must be designed and installed such that it does not cause essential loads to become inoperative, as a result of electrical power supply transients or transients from other causes.

### **7 - How does this proposed standard address the underlying safety issue (identified under #1)?**

The proposed standard addresses the need for installed electronic equipment to be designed and installed such that essential loads (as defined in JAR25.1309(e)) will not become inoperative as a result of electrical power supply transients or transients from other causes.

**8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

Since this proposal is in line with current industry practices, and it is already included by implication in Sections 25.1309(e), 25.1351(b) and 25.1353(a) it will maintain the same level of safety.

**9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.**

Since this proposal is in line with current industry practices, and it is already included by implication in Sections 25.1309(e), 25.1351(b) and 25.1353(a), it will maintain the same level of safety.

**10 - What other options have been considered and why were they not selected?**

Not to adopt the JAR requirements was considered however for the reasons as stated above the group decided to adopt the more specific requirement in accordance with fast track harmonization process.

**11 - Who would be affected by the proposed change?**

As the proposal is in line with current design practices, the effect is considered to be minimum for aircraft operators and manufacturers affected by this change.

**12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?**

None.

**13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted?**

There is no current published FAA Advisory Material and no additional materials are required.

**14 - How does the proposed standard compare to the current ICAO standard?**

This proposal is in line with ICAO Annex 8 Chapter 8 Electrical Systems.

**15 - Does the proposed standard affect other HWG's?**

This proposal does not affect other HWG's.

**16 - What is the cost impact of complying with the proposed standard?**

As the proposal is in line with current design practices the cost impact will be negligible.

**17 - Does the HWG want to review the draft NPRM at "Phase 4" prior to publication in the Federal Register?**

Yes.

**18 – In light of the information provided in this report, does the HWG consider that the “Fast Track” process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain.**

The ESHWG considers that the fast track harmonization process is appropriate for this rule.